Chapter Five
FORECASTS OF DEMAND

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Projections of aviation demand for airports in the Regional Aviation System are used to determine if System airports have facilities adequate to meet current and future user needs. For the RASP, demand projections have been developed through 2030. Projections of demand are used to identify the System's ability to fulfill the Capacity performance measure, and respond to the individual benchmarks identified for this measure.

While the RASP provides an extended projection of demand that may be anticipated at Study airports over the next 30 years, emphasis is placed on the nearer term (five- and 10-year) forecast milestones. It is assumed the RASP will be reviewed and updated during this five- to 10-year planning horizon.

It is important to note that these aviation projections are being prepared at a time when it is possible that both the commercial and general aviation industries could see short- and long-term structural changes, based on the events of September 11, 2001. While it is not possible to predict the actual impacts the events of this day will ultimately have on aviation in the U.S., a general downturn in demand, at least in the near term, is anticipated.

This chapter is organized to first provide a discussion of demand for scheduled commercial aviation that may be anticipated at Tucson International Airport. Following that discussion, projections of general aviation demand for all System airports are provided. Prior to the development and discussion of demand projections for System airports, a brief discussion of the Region's current and anticipated socioeconomic and demographic trends is provided.

MARKET AREA CHARACTERISTICS

The demand for both commercial aviation and general aviation in each market area is influenced by factors such as the market's:

- Total population and age of that population;
- Total employment and types of businesses;
- Income; and
- Tourism.

Each market has its own inherent level of demand for aviation based on these and other characteristics. Whether a particular market area captures its aviation demand or whether its aviation demand is served by competing airports in other market areas is dependent on the services and facilities provided in the market area in comparison to the facilities and services provided in competing market areas. The characteristics of the RASP market area that influence its demand for aviation are discussed in the following sections:

- Population
- Employment
- Income

Socioeconomic and demographic characteristics provide an understanding of the strength and stability of the Regional market area's growth potential. Pima County in southern Arizona, borders Santa Cruz County and Mexico to the south, Yuma County to the west, Cochise and Graham Counties to the east, and Pinal and Maricopa Counties to the north. Activities in the eastern portions of Pima County drive the Regional market area's development. Areas west of Tucson are primarily desert, wildlife refuges, or mountainous areas. Tucson is the largest municipality in Pima County, and second-largest city in Arizona. There are four other incorporated jurisdictions within the Tucson metropolitan area: Marana, Oro Valley, Sahuarita, and South Tucson.

Population

The State of Arizona experienced tremendous population growth throughout the 1990s, gaining over 1.4 million people, an increase of 40 percent, making it the second-fastest growing state in the country. The Regional market area, including Pima County, Pinal County, and Cochise County, experienced significant population increases and economic growth since 1990. **Table 5-1** shows historical and forecast growth for Cochise, Pima, and Pinal Counties and Average Annual Growth Rate (AAGR), based on Bureau of the Census data and the most recent projection series developed by the Population Statistics Unit of the Arizona Department of Economic Security, as approved in February 1997. Over 70 percent of Arizona's population growth is from migration. Pima County grew by 176,789 people in 10 years, a 26.5 percent growth rate. Cochise and Pinal Counties grew by 26,126 and 63,330, respectively, during this period.

Table 5-1
REGIONAL MARKET AREA POPULATION

	Historical Population				Forecast Population			
County	1990	2000	% Change 1990-2000	AAGR 1990-2000	2005	2010	2020	2030
Cochise	97,624	123,750	20.6%	2.4%	129,680	137,035	149,990	160,049
Pima	666,957	843,746	26.5%	2.4%	943,795	1,031,623	1,260,244	1,372,319
Pinal	116,397	179,727	54.4%	4.4%	181,487	199,715	231,229	255,695
Statewide	3,665,339	5,130,632	40.0%	3.4%	5,553,849	6,145,108	7,363,604	8,621,114

Source: 1990 & 2000 Bureau of the Census Population County; Department of Economic Security, Research Administration, Population Statistics Unit; WSA

Pima County's population is comprised of 49 percent males and 51 percent females. According to the 2000 Census, Hispanics constituted 29.3 percent of Pima County's total population, compared to 25.3 percent for the State and 12.5 percent for the nation. Of the 843,746 Pima County residents, 75.1 percent are White, 3.2 percent are Native American, 3.0 percent are African-American, 2.0 percent are Asian/ Pacific Islanders, and .01 percent are Native Hawaiian/Pacific Islanders. In addition, 3.2 percent of the County's population indicated two or more races. Pima County's median age in 2000 was 35.7 years old. Both Cochise and Pinal Counties have similar male-to-female ratios, nearly split evenly. Cochise County is 30.7 percent Hispanic, 5.3 percent Black or African-American, and 2.1 percent American Indian and Alaska Native. Pinal County is 29.9 percent Hispanic, 3.1 percent Black or African-American, and 8.7 percent American Indian and Alaska Native. It is worth noting that the location of the Sells Airport, central within the Tohono O'odham Reservation, indicates good geographic coverage and proximity for the County's American Indian population.

Employment

According to *Arizona's Economy*, a University of Arizona publication from July 2001, Tucson metropolitan area employment is led by service-producing jobs, followed by services, trade (wholesale and retail), goods producing, manufacturing, and construction. The Tucson metropolitan area was a leading region for job growth in 2000, when an estimated 13,700 jobs were created. Pima County's employment grew at an average annual growth rate of 2.06 percent from 1990 to 2000. **Table 5-2** illustrates historical and forecast county employment figures for Cochise, Pima, and Pinal Counties, based on historical growth rates and Bureau of Labor Statistics data.

Table 5-2
REGIONAL MARKET AREA EMPLOYMENT

	Historical Employment			Forecast Employment			
County	1990	2000	AAGR 1990-2000	2005	2010	2020	2030
Cochise	3,338	3,992	1.81%	4,366	4,774	5,710	6,828
Pima	301,043	369,098	2.06%	408,694	452,538	554,840	680,270
Pinal	41,739	56,745	3.12%	66,164	77,146	104,881	142,588
Statewide	1,690,048	2,245,485	2.88%	2,588,307	2,983,467	3,963,989	5,266,760

Source: Bureau of Labor Statistics, WSA

Income

The Bureau of Economic Analysis (BEA) released information stating that Arizona's personal income grew by a very strong 9.1 percent during 2000. Median household income figures, noted in **Table 5-3**, for the State of Arizona grew at an average annual rate of 2.3 percent from 1990 to 2000. Cochise County, Pima County, and Pinal County each experienced average annual growth rates above the statewide average. By 2020, Pima County's median household income will nearly double its 2000 figure if growth continues at a similar rate.

Table 5-3
REGIONAL MARKET AREA INCOME

	Historical Median Income				Forecast Median Income			
County	1990	1998	2000*	AAGR 1990-2000	2005	2010	2020	2030
Cochise	$23,959	$29,295	$30,805	2.55%	$34,930	$39,608	$50,926	$65,478
Pima	$24,839	$32,544	$34,818	3.43%	$41,223	$48,806	$68,414	$95,900
Pinal	$21,491	$28,003	$29,919	3.36%	$35,301	$41,651	$57,984	$80,723
Statewide	$28,924	$34,751	$36,383	2.32%	$40,805	$45,765	$57,566	$72,411

*2000 figures are estimated from 1990-1998 historical data

Source: U.S. Bureau of Census, Housing and Household Economic Statistics Division, WSA.

Tourism

Tourism is a significant player in the southeastern Arizona economy and is reflected in one out of every ten jobs in the PAG region. Natural wonders like the Saguaro National Monument and Karchner Caverns, world class attractions like the Arizona-Sonora Desert Museum and San Xavier Mission and western places like Tombstone and Tubac bring record numbers of visitors to the area. The peak of the tourism season is January through March and many visitors to the region choose to travel by air.

While direct correlations between demand for aviation and aviation-related services and various socioeconomic and demographic factors can exist, in today's aviation environment these direct correlations are often limited and in some instances non-existent. Nevertheless, when a particular market area is characterized by increasing population, employment, and growing income, its demand for aviation and aviation-related services typically also responds. As shown, based on its socioeconomic and demographic indicators, the market area should expect strong demand for aviation over the next 30 years.

Commercial Demand

When an airline traveler chooses a departure airport, they consider fare, frequency of service, choice of airlines, nonstop versus connecting service, and type of aircraft used. Each traveler weighs these factors differently when selecting a departure airport. Even though Phoenix Sky Harbor International Airport is almost two hours from the Tucson market area, some airline travelers destined to and from the Tucson area do opt to begin or end their airline travel in Phoenix.

The Tucson Airport Authority is in the process of quantifying this "passenger leakage." The Authority works aggressively to maintain its base of commercial airline travel and to improve the level and quality of commercial airline service provided at Tucson International Airport. Some passengers associated with the Tucson market area, however, still continue to select Phoenix for their departures because of its perceived lower fares and higher levels of service. It is important to note that, since the last RASP was completed in 1995, Tucson International has experienced increases in its airline service. A discussion of the airport's current commercial airline service environment follows.

Tucson International Airport Airline Environment

September 11, 2001

In light of the September 11, 2001 attacks, the commercial service industry has changed dramatically. The changes to the airline industry as a result of the September 11 attacks are recent and evolving. The final impacts of September 11 on the commercial airline industry in the U.S. may not actually be known for some time.

At present, airport security is being overhauled and the airlines are preparing for a sharp drop in business that could last indefinitely. With huge fixed costs, including billions of dollars in airplane debt and thin profit margins, airlines run up losses very quickly when traffic plunges. On September 21, Congress and President Bush agreed to a $15 billion emergency bailout for the airline industry, which included $5 billion in cash and $10 billion in loan guarantees.

However, many domestic and international carriers still made capacity and workforce cuts of up to 20 percent and delayed the delivery of aircraft. Southwest Airlines, the largest carrier at Tucson International, is the only carrier in the U.S. that did not immediately reduce its schedule. From a financial standpoint, Southwest was in the best position among all U.S. carriers. However, America West, the second-largest carrier at Tucson International, immediately reduced its flight schedule by 20 percent, and has cut 2,000 employees. US Airways, Delta, and United are terminating all or part of the "low-fare" components of their operations. US Airways' Metrojet is discontinuing operations and retiring its fleet, while Delta Express is discontinuing half of its operations. Metrojet and Delta Express connect northeastern U.S. airports with Florida. United Shuttle, which serves western U.S. airports, including Tucson, with high-frequency nonstop service, was discontinued as of October 31, 2001.

All airports, including Tucson International, will continue to be battered by the financial impacts of the terrorist attacks well into 2002. Lighter passenger loads, the expense of enhanced security mandated by FAA, reduced collection of landing fees, and higher insurance costs are creating financial strains on all airports. In addition, many carriers are going directly to the airports they serve to request a hiatus in rental and fee collections. If traffic and revenues do not bounce back, many airports that are highly leveraged are concerned with their ability to pay back accumulated debt. Many airports are reconsidering or post-poning expansion and construction plans. Airports basing expansion on federally authorized passenger facility charges (PFCs) are rethinking their plans until passenger demand returns to pre-attack levels. It is estimated that it will take up to 12 months for the carriers to return to breakeven load factors.

Airline Service at Tucson International Airport

Since the release of the last RASP in 1995, scheduled commercial service at Tucson International Airport has been affected by many factors independent of individual market conditions. The most significant of these factors include airline mergers, the demise of other major carriers, the entrance of low-cost carriers, fleet and route-system decisions by carriers, and the September 11, 2001, terrorist attacks. While there are certainly other factors at work, these factors have helped to shape air service as it is presently in place at Tucson International Airport.

During the recession in the early 1990s, TWA and US Airways exited the Tucson International market as part of the restructuring of their operating practices. Both airlines, however, continued to suffer financial difficulties. In 2001, after years of financial struggles, American purchased Trans World (TWA) and, in the same year, United attempted to purchase the struggling US Airways.

Tucson International's increase in passenger traffic in the 1993-1995 period was most directly linked to the entrance of start-up low-fare carriers, Morris Air and Reno Air. Major/national carriers acquired both airlines soon after scheduled service began at Tucson. In October 1994, another low-fare carrier, Southwest Airlines, finalized its purchase of Morris Air and assumed the carrier's routes between Tucson and Los Angeles, Las Vegas, San Diego, and Oakland. Although service to Oakland was discontinued in 1999, Southwest began nonstop service between Tucson and Albuquerque the same year.

At the end of 1998, American Airlines purchased Reno Air. Although American Airlines did not continue Reno Air's nonstop service between Tucson and Los Angeles and Las Vegas, Southwest Airlines responded to the buyout with added capacity on both routes.

Other carriers who serve Tucson continued to provide the market with strong service to their respective hubs. Since 1993, American Airlines expanded nonstop service to its hubs at Dallas/Ft. Worth and Chicago-O'Hare. In 2001, American added an additional daily flight between Tucson and Chicago. United Airlines focused on feeding its hubs in Denver and Los Angeles with United Shuttle service. United introduced nonstop service between Tucson and Los Angeles in 1997 and has doubled the number of nonstop flights offered to Denver since 1993.

With new competition from Southwest Airlines and continued adjustments in operating practices in order to achieve profitability, some of the other full-fare major/national carriers reduced or redistributed capacity at Tucson International. Four carriers have made scheduling adjustments at the airport over the last 10 years. Delta has discontinued service to two nonstop points served by Southwest, Los Angeles and Albuquerque, and has increased or initiated new service to hubs in Cincinnati, Salt Lake City, and Dallas/ Ft. Worth.

Continental discontinued nonstop service between Tucson and Denver in 1994, in conjunction with the closing of its hubbing operations at Denver. Continental's short-lived low-cost carrier, CALite, briefly operated nonstop service between Tucson and Orange County between 1994 and 1995. CALite, which focused largely on short-haul markets east of the Mississippi, was an unprofitable venture for Continental. CALite was dissolved in early 1995. Continental has, however, retained twice-daily nonstop service to its Houston-Intercontinental hub from Tucson. By 1993, Alaska Airlines pulled service at Tucson International as part of its own operational overhaul. In October 2000, however, Alaska Airlines began nonstop service to Tucson again, providing Tucson area passengers with service to Seattle and San Jose. Northwest discontinued nonstop service to Phoenix in 1996. However, the carrier has increased nonstop service to its hub in Minneapolis/St. Paul.

America West, the second-largest carrier at Tucson International Airport, again emerged from bankruptcy in 1994 and continued to provide a high percentage of the airport's service. The level of service at Tucson provided by its second-largest carrier has remained relatively unchanged since 1993. America West continues to feed Tucson area passengers to its hubs in Phoenix and Las Vegas. Mesa Airlines, America

West's regional partner, also operates a daily turboprop flight between Tucson and Phoenix. America West also has an extensive code-share agreement with Continental Airlines.

International service has changed little since the last RASP was completed in 1995. Although Air Arizona no longer operates, Mexican carriers Aerolitoral and Aero California provide nonstop service at Tucson International. These carriers operated 10 weekly flights between Tucson and Hermosillo in October 2001.

The general impacts on the commercial airline industry from the events September 11 were discussed earlier; specific impacts on Tucson International are as follows:

- Alaska Airlines cancelled one daily nonstop flight to Seattle.
- American is operating six of the seven daily flights to Dallas/Ft.Worth that were operated prior to the terrorist attacks.
- United cancelled all United Shuttle operations, which included all of the carrier's flights between Tucson and Denver and Tucson and Los Angeles.
- The three daily flights between Tucson and Denver were substituted with thrice-daily service by United on Boeing 737-300 jet aircraft.
- The four daily fights to Los Angeles were substituted with four daily flights on United Express carrier, SkyWest, using Canadair Regional Jet aircraft.
- Daily seats departing Tucson International on United were reduced by 59 percent.

As shown in **Table 5-4**, 12 scheduled carriers served Tucson International in October 2001. Most of the carriers (eight out of 12) were major/national carriers. A major/national carrier is classified as an airline with yearly gross operating revenues over $75 million. Two other carriers, Mesa and SkyWest, are regional/commuter carriers feeding their respective major partners, America West and Delta/United. There are also two smaller Mexican carriers, Aerolitoral and Aero California, providing nonstop service between Tucson and Mexico. Southwest was the largest carrier at Tucson International, with 21 percent (90 out of 428) of the scheduled weekly departures. America West was the second-largest carrier, with 19.4 percent of the total weekly departures. American was third-largest carrier, operating nearly 15 percent of the weekly departures at the airport.

The scheduled carriers operating at Tucson International carry passengers to a variety of domestic and Mexican destinations. In October 2001, Southwest, the largest carrier at the airport, offered daily nonstop service to Los Angeles, Las Vegas, San Diego, and Albuquerque. Other carriers at Tucson International provided nonstop service to 14 destinations, 11 of which are considered connecting hub airports for these carriers. Carriers providing nonstop service at Tucson International and their respective hubs are as follows:

- America West/Mesa - Phoenix, Las Vegas
- American - Dallas/Ft. Worth, Chicago-O'Hare
- United - Los Angeles, Denver
- Delta/SkyWest - Dallas/Ft. Worth, Salt Lake City, Cincinnati, Atlanta
- Alaska - Seattle
- Continental - Houston-Bush Intercontinental
- Northwest -Minneapolis

Table 5-4
TUCSON INTERNATIONAL AIRPORT
WEEKLY SCHEDULED DEPARTURES (October 2001)

Carrier	Weekly Flights	Market Share
Southwest Airlines	90	21.0%
America West Airlines	83	19.4%
American Airlines	63	14.7%
United Airlines	56	13.1%
Delta Airlines	42	9.8%
Alaska Airlines	28	6.5%
SkyWest	21	4.9%
Continental Airlines	14	3.3%
Aerolitoral	13	3.0%
Mesa	8	1.9%
Northwest Airlines	7	1.6%
Aero California	3	0.7%
TOTAL	428	100.0%

Source: Official Airline Guide.

As shown in **Exhibit 5-1**, Tucson International Airport experienced a great deal of passenger growth between 1993 and 1995. This growth was fueled largely by the entrance of low-fare carriers Morris Air and Reno Air, as well as the subsequent acquisition of Morris Air by Southwest Airlines. Fares declined 19 percent between 1993 and 1995. This decrease in fares stimulated enplanements, which grew 37 percent over the period. Since 1995, enplanements have remained relatively flat, while fares have increased slightly.

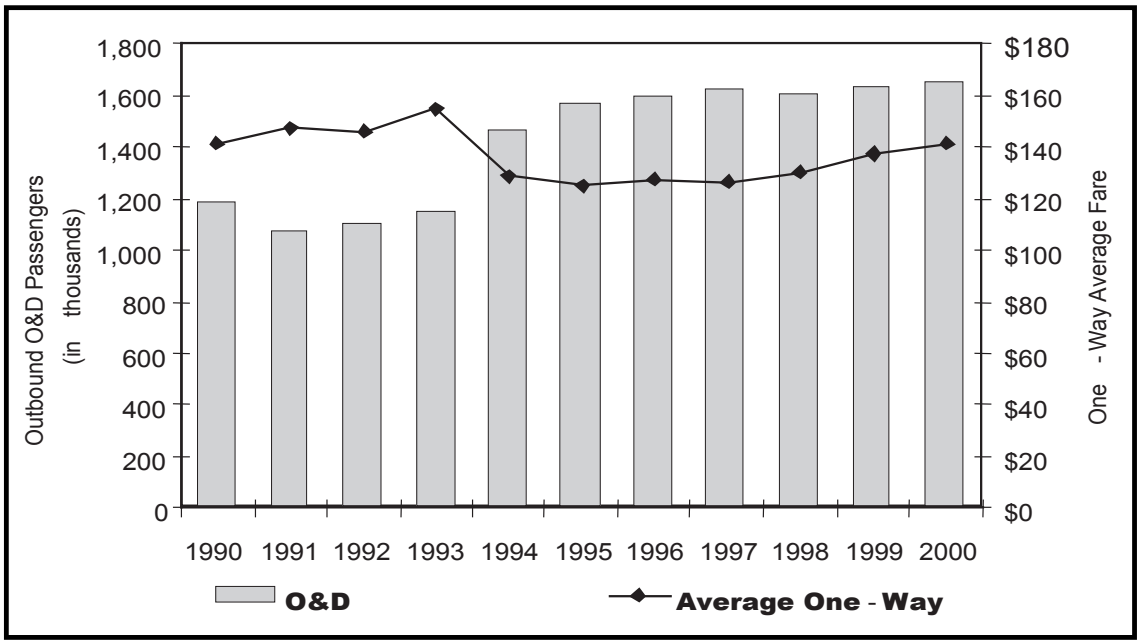
The airport's top 30 domestic origin-destination (O&D) markets are depicted in **Exhibit 5-2**, along with travel patterns to various regions in the U.S. Nearly 73 percent of the passengers originating at Tucson International were destined for these top 30 airports. As shown, nearly 42 percent of the passengers originating on flights at Tucson International are destined for airports in the southwestern U.S. Over 25 percent of O&D passengers were destined for the airport's top three O&D markets, namely Los Angeles (13.2 percent), Las Vegas (6.5 percent), and San Diego (6.1 percent). Southwest Airlines operates daily nonstop service between Tucson International and each of these markets. San Jose and Oakland, located in the southwest region, are also in Tucson's top 10 O&D markets. Over 13 percent of the airport's O&D passengers were destined for locations in the Northeast and Midwest regions of the U.S. Nearly 12 percent were destined for South-Central U.S. airports, including Dallas/Ft. Worth, Albuquerque, and Houston-Bush Intercontinental airports.

Total Annual Commercial Enplanements

Demand for commercial aviation in the RASP Study area is served by Tucson International Airport. An airport's demand for commercial aviation can perhaps best be expressed in terms of the number of annual boarding or enplaned passengers it serves. Historic annual enplaned passengers for Tucson International for the period from 1985 through 2000 are shown in **Table 5-5**.

As shown in this table, the airport's enplaned passengers experienced little actual growth over the period 1985 to 1993. Although some spikes in demand were recorded during this historic period (between 1985 and 1993), annual enplaned passengers grew at an average annual rate of less than 1 percent. This annual rate of growth was below the average annual rate of growth experienced for all domestic enplanements in the U.S. over this same historic period. Comparatively, total domestic enplanements in the U.S. between 1985 and 1993 grew at an average annual rate of 3.4 percent.

Exhibit 5-1
TUCSON INTERNATIONAL AIRPORT OUTBOUND DOMESTIC O&D PASSENGER TRENDS



Source: U.S. DOT, Air Passenger Origin-Destination Survey, reconciled to Schedules T-100 and 298C T-1.

Beginning in 1994 and continuing through 1995, Tucson International reported a notable increase in its level of annual enplaned passengers. This was the period in which Southwest Airlines began service to Tucson International. Following these years of initial growth, however, enplanements at Tucson International experienced much lower rates of annual growth. This type of rapid growth, followed by a "leveling off," is typical of patterns in most markets where a low-fare carrier introduces service.

Despite the fact Tucson International has been able to attract low-fare carrier service since the last RASP, the level of competing service provided at Phoenix Sky Harbor International continues to draw commercial airline travelers actually associated with the Tucson market area. A recent study by the Tucson Airport Authority estimates that, each year, between 250,000 and 500,000 Tucson-related enplanements leave the Tucson market area for Phoenix to begin their airline travel. These "uncaptured" enplanements will be considered as future ranges of demand, and are identified for Tucson International in the RASP.

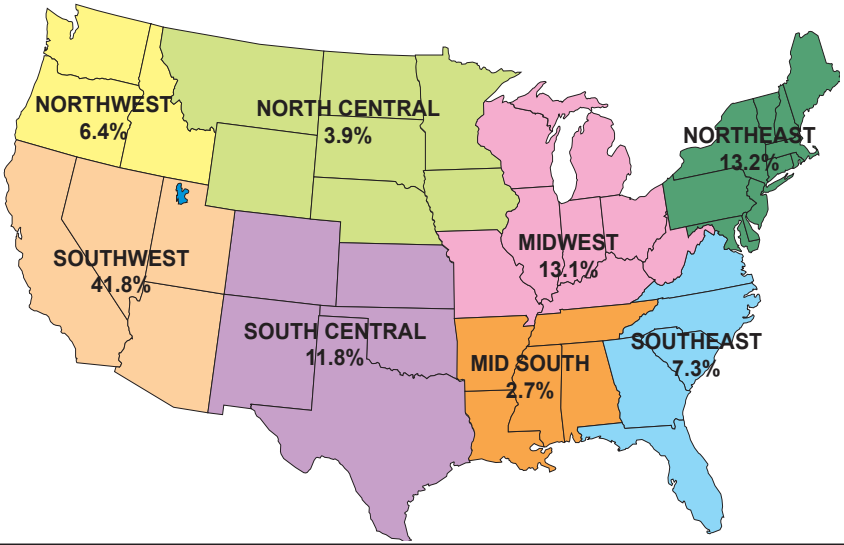
Projections of future enplanements for Tucson International were developed using several techniques; these methodologies include the following:

- Market share
- Trend analysis
- Exponential smoothing

Rank	Code	Destination Airport	Outbound O&D Passengers	2000 Percent of Total
1	LAX	Los Angeles	217,620	13.2%
2	LAS	Las Vegas	106,840	6.5%
3	SAN	San Diego	99,760	6.1%
4	ORD	Chicago-O'Hare	69,100	4.2%
5	SEA	Seattle	52,120	3.2%
6	DFW	Dallas/Ft. Worth	45,590	2.8%
7	DEN	Denver	42,440	2.6%
8	SJC	San Jose	41,790	2.5%
9	OAK	Oakland	40,180	2.4%
10	ABQ	Albuquerque	33,540	2.0%
11	SFO	San Francisco	33,050	2.0%
12	EWR	Newark	31,430	1.9%
13	SLC	Salt Lake City	30,480	1.8%
14	PDX	Portland	28,260	1.7%
15	LGA	New York-LaGuardia	27,460	1.7%
16	DCA	Washington-National	26,580	1.6%
17	MSP	Minneapolis/St. Paul	25,510	1.5%
18	SMF	Sacramento	24,960	1.5%
19	BOS	Boston	24,470	1.5%
20	ATL	Atlanta	23,630	1.4%
21	MCI	Kansas City	20,170	1.2%
22	ONT	Ontario	19,440	1.2%
23	BWI	Baltimore	18,280	1.1%
24	IAH	Houston-Bush	17,530	1.1%
25	RNO	Reno	17,260	1.0%
26	PHL	Philadelphia	16,910	1.0%
27	DTW	Detroit	15,720	1.0%
28	STL	St. Louis	15,460	0.9%
29	IAD	Washington-Dulles	15,340	0.9%
30	TPA	Tampa	14,150	0.9%
		All Remaining Markets	452,680	27.5%
		Total — All Markets	1,647,750	100.0%

Destination Region	Outbound O&D Passengers	2000 Percent of Total
Southwest	688,680	41.8%
Northeast	217,390	13.2%
Midwest	216,410	13.1%
South Central	193,780	11.8%
Southeast	116,530	7.1%
Northwest	105,940	6.4%
North Central	64,890	3.9%
Mid South	44,130	2.7%
Total-All Regions	1,647,750	100.0%

SOURCE: DOT, O&D Survey, reconciled to Schedules T-100 and 298C T-1.



PAG RASP UPDATE

DOMESTIC OUTBOUND O&D PASSENGERS
TUCSON INTERNATIONAL AIRPORT
(for the year ended December 31, 2000)

Exhibit 5-2

Table 5-5
TUCSON INTERNATIONAL AIRPORT
HISTORIC ENPLANED PASSENGERS

Year	Enplanements		TIA Eps. as Percent of U.S. Total
	Tucson Intl. Airport	All U.S. Airports	
1985	1,229,762	399,560,366	0.308%
1986	1,425,149	431,453,438	0.330%
1987	1,576,439	470,290,896	0.335%
1988	1,435,823	481,832,808	0.298%
1989	1,364,872	481,138,115	0.284%
1990	1,333,292	495,399,518	0.269%
1991	1,221,546	489,154,786	0.250%
1992	1,252,251	510,598,097	0.245%
1993	1,305,123	520,038,158	0.251%
1994	1,561,999	562,059,193	0.278%
1995	1,713,680	582,042,553	0.294%
1996	1,758,251	613,637,402	0.287%
1997	1,769,476	637,497,675	0.278%
1998	1,750,230	649,125,618	0.270%
1999	1,774,759	674,139,713	0.263%
2000	1,816,142	706,106,262	0.257%
Average Annual Growth Rates			
1985-2000	2.6%	3.9%	
1995-2000	1.2%	3.9%	
FORECAST METHODOLOGY: MARKET SHARE			
2005	2,267,514	897,417,732	0.253%
2010	2,536,312	1,022,142,524	0.248%
2020*	3,189,614	1,334,184,505	0.239%
2030*	3,814,632	1,658,535,801	0.230%
FORECAST METHODOLOGY: HISTORIC GROWTH RATES 1985-2000			
2005	2,068,201	2.6%	
2010	2,355,242	2.6%	
2020*	3,054,369	2.6%	
2030*	3,961,022	2.6%	
FORECAST METHODOLOGY: HISTORIC GROWTH RATES 1995-2000			
2005	1,924,730	1.2%	
2010	2,039,811	1.2%	
2020*	2,291,026	1.2%	
2030*	2,573,180	1.2%	

Sources: Tucson International Airport, Wilbur Smith Associates, FAA - Terminal Area Forecast.
Note: * Extrapolated.

All of these methodologies are consistent with those described and recommended by the FAA in their most recent guidelines on aviation demand forecasting.

Market Share Methodology Commercial Enplanements

One methodology considered to identify future enplanement levels for Tucson International examined the airport's historic market share of total domestic enplaned passengers in the U.S. This information is presented in Table 5-5. As shown in this table, the airport's market share of total domestic U.S. enplanements actually peaked in 1987. Corresponding to the entrance of Southwest Airlines into the market in the mid-1990s, the airport's share of total U.S. enplanements again peaked. Tucson International's market share of total U.S. domestic enplanements has ranged from a high of .34 percent to a low of .25 percent. Over the last 15 years, the airport has maintained a market share equivalent to an average of .28 percent of total U.S. enplanements. (See Table 5-5.)

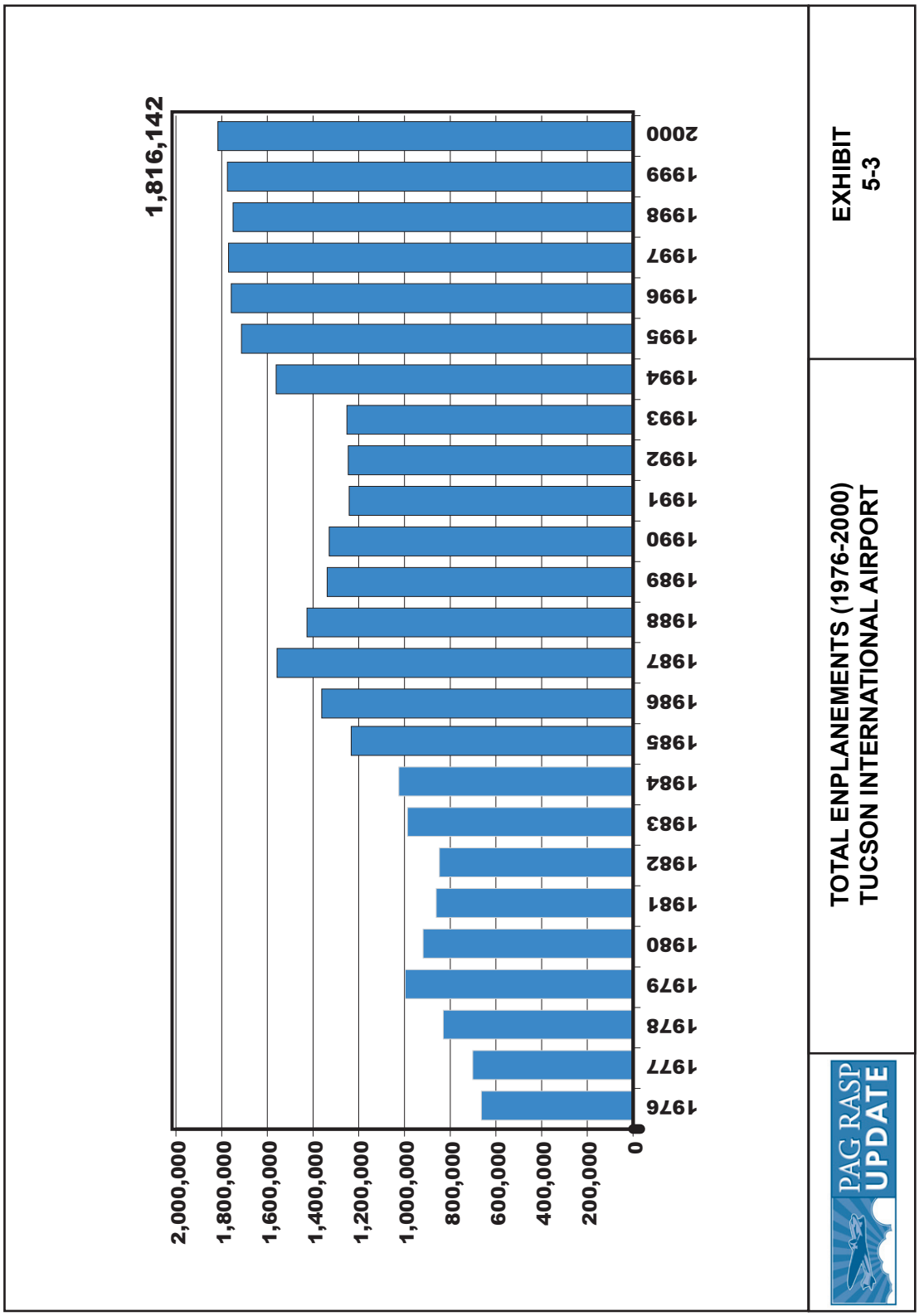
Each year, the forecasting branch of the FAA prepares projections of total aviation demand; these projections are prepared on both the national and, in some cases, the individual airport level. FAA projections for individual commercial and general aviation airports in the U.S. national airport system are prepared each year as part of the Terminal Area Forecast (TAF). The FAA releases updated projections each year in the February-March time frame.

The most recent projections of demand published by the FAA extend through 2012-2015. Using average annual FAA growth rates implied in the national forecast, total enplaned domestic passengers in the U.S. could reach 1.6 billion by 2030. Examining the airport's historic market share of total U.S. enplanements (see Table 5-5) indicates that, over the past 15 years, the airport's market share has exhibited a slight downward trend; based on the 15-year history, it can be assumed that this trend in market share could continue over the 30-year forecast period. Using a future market share of total U.S. enplanements for Tucson International and an extrapolated projection of FAA's total annual domestic enplanements for the U.S., the following projection of total annual commercial enplanements for Tucson International Airport was developed:

Current Enplanements	Projected Enplanements
2000 – 1,816,142	2005 – 2,267,514
	2010 – 2,536,312
	2020 – 3,189,614
	2030 – 3,814,632

Trend Analysis/Growth Rate Methodology Commercial Enplanements

Exhibit 5-3 graphically depicts the growth in total annual enplanements that Tucson International has experienced. As shown in this graphic, total annual enplanements at the airport have increased over time, but it is important to note that this historic growth has been characterized by various advances and declines. Peaks in historic demand at the airport are directly tied to periods when Tucson International saw the introduction of new service by new carriers. An excellent example of this phenomenon occurred in the 1994-1995 time frame when Southwest Airlines initiated service to the Tucson market.



Source: FAA Terminal Area Forecast, 2001. / Tucson International Airport.

The trend/growth rate methodology examines actual increases in demand that have been encountered over an historic period, calculates the rate of this growth, and assumes that future increases in demand will mirror historic growth patterns. For enplanements at Tucson International Airport, rates of growth during two historic periods were examined. The first of these periods extends from 1985 through 2000, and the second is for the airport's most recent five years (1995-2000). Over these two historic periods, the airport's total annual enplanements have increased at an average annual rate of growth of 2.65 percent and 1.15 percent, respectively.

These two historic growth trends were applied to the airport's current levels of enplanements to produce two different growth/trend projections. These two projections are also shown in Table 5-5.

Exponential Smoothing Model Methodology Commercial Enplanements

The final methodology used an exponential smoothing model to develop a projection of total annual enplanements for Tucson International Airport. This model considers an airport's historic growth, giving a heavier importance weighting to the airport's most recent five years of activity. The projection of annual enplanements developed using the exponential smoothing model is shown in **Table 5-6** and is graphically depicted in **Exhibit 5-4**.

In addition to presenting results of the exponential smoothing methodology for enplaned passengers at Tucson International, Table 5-6 also compares the results of this projection technique to the most recent TAF enplanement projections for Tucson International. Projections contained in the most current TAF do not extend through the planning period being considered in the RASP. As a result, the FAA's implied rate of average annual growth for Tucson International's enplanements was used to extrapolate the TAF projection through 2030.

Comparison of Enplanement Projection Methodologies

The three methodologies used to project enplanements for Tucson International produced varying results. As a result of these variations, the results from the three RASP methodologies were compared to enplanement projections contained in the Arizona State Aviation Needs Study (SANS), the airport's most recent master plan, and the FAA TAF. The results of the RASP projections, as well as those from the SANS, the airport's most recent master plan, and the TAF, are shown in **Table 5-7**.

As shown, the six methodologies produce a range of enplanement projections for Tucson International Airport. As shown in Table 5-7, total annual enplanements at Tucson International, depending upon the methodology used, could range from a low of 2.5 million to a high of 6.5 million in 2030.

Forecast of Annual Enplanements

Because of the fluctuations that Tucson International has historically experienced in its annual levels of enplaned passengers and because of the near-term uncertainties that exist in the nation's commercial

airline industry, a range of future enplanement projections were selected for Tucson International. This range of future demand is shown below; these projections will be used in subsequent portions of the RASP to evaluate the adequacy of the Region's airport system.

Tucson International Total Annual Enplanement Forecasts

	High Growth Scenario	Average Growth Scenario
2005	2,068,201	1,952,288
2010	2,355,242	2,088,434
2020	3,054,369	2,360,725
2030	3,961,022	2,633,017

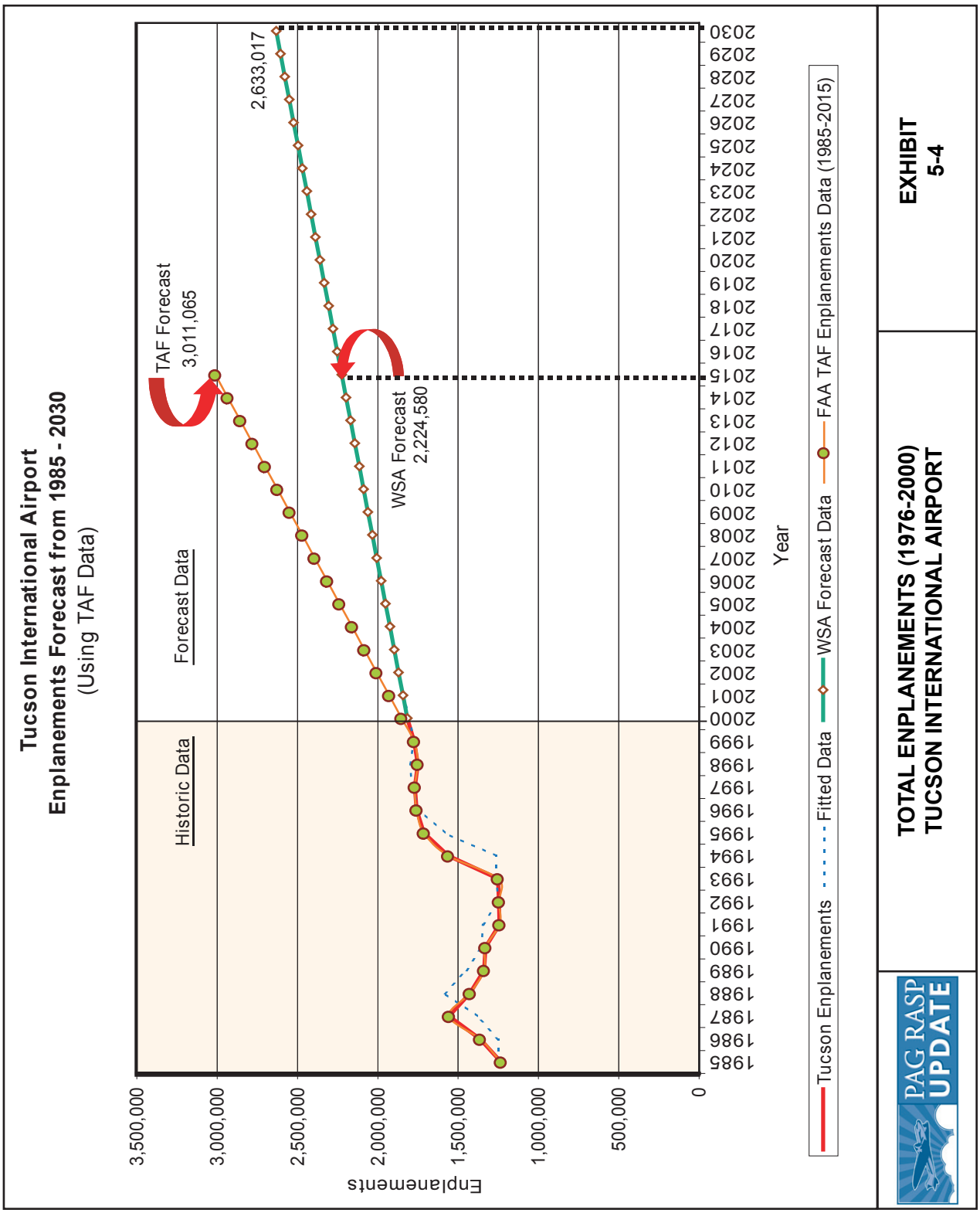
Based on a review of the existing enplanement projections and those developed for the RASP, the results from the 1985-2000 growth rate projection were selected to represent a "high growth" scenario for enplanements at Tucson International and the results of the exponential smoothing model were selected to represent an "average growth" scenario for the airport's total annual enplanements.

The average growth scenario recognizes the airport's most recent five-year history for passenger enplanements and the recent events that have dampened the nation's commercial airline travel. While not nearly as aggressive as the TAF, the SANS, or the airport's most recent master plan, the historic growth rate projection reflects the airport's ability to attract an increasing number of passenger enplanements over an extended period of time. The airport's master plan projection of enplanements appears overly aggressive in light of recent activity at Tucson International. Projections contained in the airport's most current master plan were based on the high growth that occurred in the airport's enplanements in the 1994-1995 time frame. Future revisions to the airport's master plan will most likely be more consistent with the range of passenger enplanements identified by the RASP.

Table 5-6
TUCSON INTERNATIONAL AIRPORT
EXPONENTIAL SMOOTHING ENPLANEMENT PROJECTION

Year	Tucson Enplanements	Fitted Data	WSA Forecast Data	FAA TAF Data (1985-2015)
Historic				
1985	1,233,040	1,250,538		1,233,040
1986	1,362,467	1,249,840		1,362,467
1987	1,557,101	1,383,762		1,557,101
1988	1,426,465	1,585,314		1,426,465
1989	1,337,922	1,448,338		1,337,922
1990	1,329,710	1,355,389		1,329,710
1991	1,242,111	1,346,152		1,242,111
1992	1,245,790	1,254,401		1,245,790
1993	1,252,472	1,257,736		1,252,472
1994	1,561,999	1,264,208		1,561,999
1995	1,713,680	1,585,620		1,713,680
1996	1,758,251	1,742,412		1,758,251
1997	1,769,476	1,787,615		1,769,476
1998	1,750,230	1,798,116		1,750,230
1999	1,774,759	1,776,959		1,774,759
2000	1,816,142	1,801,400	1,816,142	1,852,028
Projected				
2005			1,952,288	2,238,373
2010			2,088,434	2,624,719
2020			2,360,725	3,429,035*
2030			2,633,017	4,447,087*

Sources: Tucson International Airport; Wilbur Smith Associates; FAA, Terminal Area Forecast.
Note: *Extrapolated.


Tucson International Airport
Enplanements Forecast from 1985 - 2030
(Using TAF Data)
Historic Data
Forecast Data
TAF Forecast
3,011,065
WSA Forecast
2,224,580
2,633,017
Enplanements
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3,000,000
2,500,000
2,000,000
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Tucson Enplanements
Fitted Data
WSA Forecast Data
FAA TAF Enplanements Data (1985-2015)
TOTAL ENPLANEMENTS (1976-2000)
TUCSON INTERNATIONAL AIRPORT
PAG RASP UPDATE
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5-4

Table 5-7
TUCSON INTERNATIONAL AIRPORT
COMPARISON OF ENPLANEMENT PROJECTIONS

Historic	Total Enplanements						
1985	1,229,762						
1990	1,333,292						
1995	1,713,680						
2000	1,774,759						
2001	1,816,142						
Projected	Market Share	Growth Rate (1985-2000)	Growth Rate (1995-2000)	Exponential Smoothing	TAF	SANS	Master Plan
2005	2,267,514	2,068,201	1,924,730	1,952,288	2,238,373	2,214,162	2,809,000
2010	2,536,312	2,355,242	2,039,811	2,088,434	2,624,719	2,580,682	3,022,000
2020	3,189,614	3,054,369	2,291,026	2,360,725	3,524,671	3,505,778	4,466,000*
2030	3,814,632	3,961,022	2,573,180	2,633,017	4,829,650	4,762,492	6,599,980*

* Source: TAF, SANS, and Master Plan projections have been extrapolated to match forecast horizons for the RASP.

Total Annual Operations

Total annual operations at Tucson International are comprised of several different demand components. These include operations by scheduled commercial airlines, operations by air taxi operators, operations by military aircraft, and operations by based and transient general aviation aircraft. Operations in the air taxi category encompass activity by the airport's limited number of commuter operators, charter carriers, and for-hire general aviation operations.

Tucson International Airport is the only airport in the RASP system that accommodates operations by commercial airlines. **Table 5-8** depicts the airport's historic annual operations between 1985 and 2000. As shown in this table, the airport's total annual commercial operations have experienced limited growth since 1994. The airport's lack of historic growth, related to commercial airline operations, is directly related to two factors. One of these factors is passenger loads or load factors (the percent of seats filled versus the number of seats available), and the other is the seating capacity of the commercial aircraft serving the Tucson market.

At the time of the last RASP, the passenger load factors, or seat occupancy rates, were notably below the national average. In fact, information from the PAG RASP that was published in 1995 indicates that commercial aircraft leaving the Tucson market were departing at less than 50 percent of their maximum occupancy rate. Prior to September 11, 2001, the nation's commercial airlines were reporting passenger load factors that approached and often exceeded, on average, 80 percent of available seating capacity.

Table 5-8

**TUCSON INTERNATIONAL AIRPORT
HISTORIC AIRCRAFT OPERATIONS**

Year	Air Carrier	Air Taxi & Commuter	General Aviation	Military	TOTAL OPERATIONS
1985	37,765	7,007	163,548	28,754	237,074
1986	43,646	6,157	163,904	24,698	238,405
1987	47,649	8,451	156,598	31,242	243,940
1988	43,063	9,139	153,314	33,239	238,755
1989	42,792	8,954	136,700	33,458	221,904
1990	42,765	7,375	142,547	36,085	228,772
1991	42,031	5,216	150,899	36,726	234,872
1992	38,011	6,161	154,217	36,920	235,309
1993	36,400	8,810	144,567	39,100	228,877
1994	43,911	18,239	147,148	40,431	249,729
1995	47,033	16,320	139,327	35,344	238,024
1996	46,449	14,330	142,329	42,821	245,929
1997	46,290	11,489	138,196	42,313	238,288
1998	45,436	9,872	152,039	43,613	250,960
1999	44,931	8,760	178,632	54,039	286,362
2000	45,790	13,208	144,979	46,966	250,943

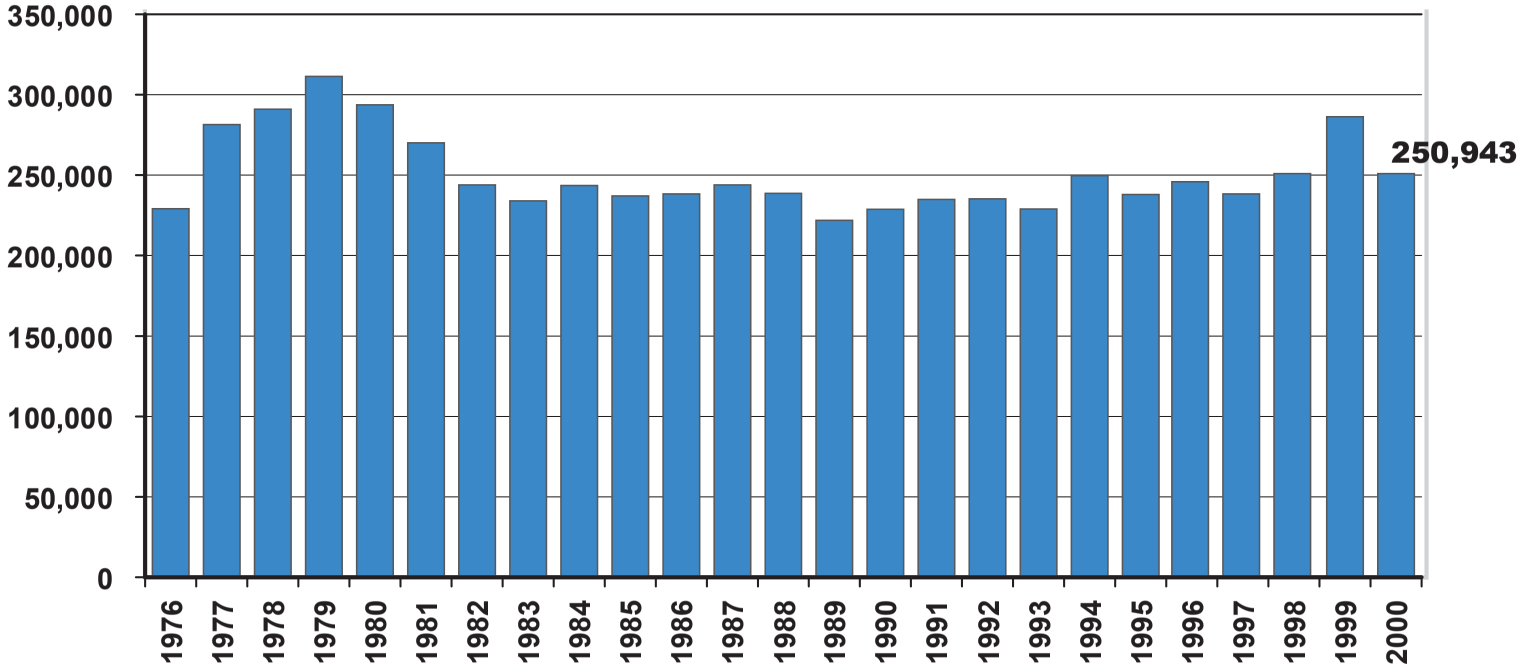
Sources: FAA, Terminal Area Forecasts; Tucson International Airport.

As a result of "unused" seating capacity, commercial airlines operating at Tucson International have historically been able to increase the number of passengers they enplaned without realizing a corresponding increase in their departures from the airport. At the same time, the size of the commercial aircraft serving Tucson International Airport has experienced an increase in terms of total seating capacity. When combined, these two factors account for the market's increased number of enplanements that occurred, without a corresponding and proportional increase in the market's number of annual commercial airline operations.

As with enplanements that were discussed in the previous section, different methodologies were considered to produce projections of operations for Tucson International Airport in 2030. These methodologies are discussed in the following sections.

Trend Analysis/Growth Rate Methodology Annual Operations

Total annual operations for Tucson International Airport are depicted graphically in **Exhibit 5-5.** As shown in this exhibit, the airport's total annual operations have shown an increasing trend over the past 15 years. Total annual operations at the airport, even in the commercial category, have not shown the same peaks as the airport's enplaned passengers have, again, for the aforementioned reasons. In addition,



PAG RASP UPDATE

TOTAL OPERATIONS (1976-2000)
TUCSON INTERNATIONAL AIRPORT

EXHIBIT
5-5

the majority of the airport's total annual operations has been, and continues to be, in the general aviation category. (See Table 5-8.)

Exhibit 5-6 reflects the distribution of the airport's total annual operations in 1995 and in 2000; as shown in this exhibit, general aviation operations now comprise a similar percentage of the airport's total annual operations. Both total annual general aviation operations and military operations have reported notable increases in recent years. (See Table 5-8.)

Between 1995 and 2000, the total annual operations at Tucson International increased at an average annual rate of 1.1 percent. If this same average annual rate of increase is maintained over the next 30 years, Tucson International Airport could expect 344,589 total annual aircraft operations by 2030. (See **Table 5-9**.)

Exponential Smoothing Model Methodology Total Annual Operations

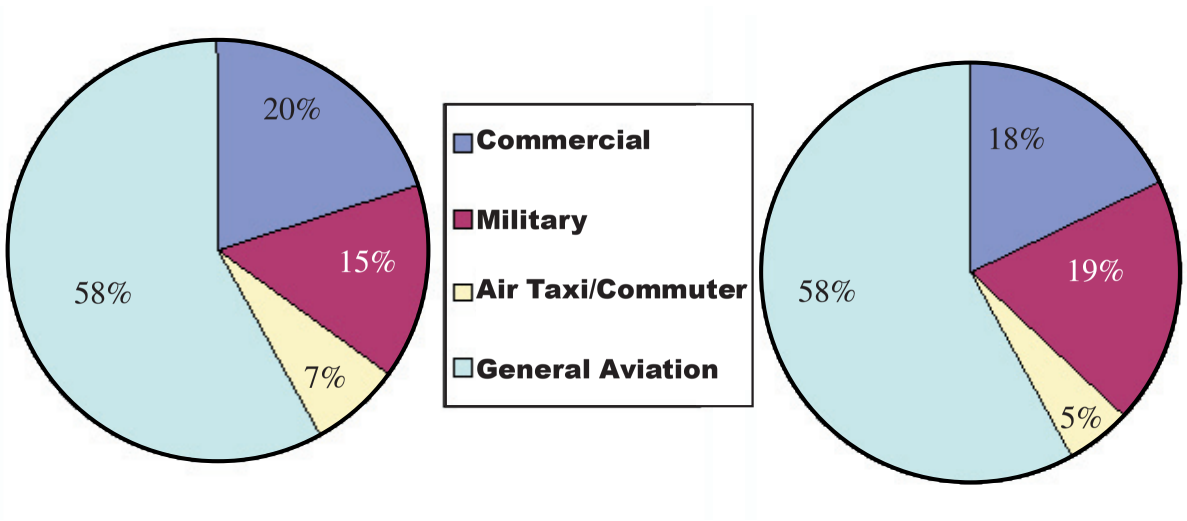
As with total annual enplanements, an exponential smoothing model was used to develop a projection of total annual aircraft operations for Tucson International Airport. This methodology and model considered all facets of annual aviation activity at the airport, including operations in the commercial, air taxi, military, and general aviation categories.

As previously noted, exponential smoothing is a methodology supported by the FAA in their most recent guidelines on aviation demand forecasting. The exponential smoothing model considers growth over an historic period, giving an increased "weighting" to trends that have characterized growth in the most recent years. Using the exponential smoothing methodology and model, total annual aircraft operations for Tucson International are projected to increase from the 2000 level of 250,943 to 348,028 in 2030. The projection of total annual demand for Tucson International, using the exponential smoothing model, is shown in **Table 5-10**. It should be noted for this methodology that military operations were held constant at their recent historic high of 54,000 annual operations. The Airport Authority and the military have agreements that limit the growth of military activity.

Comparison of Projections of Total Annual Aircraft Operations

As with total annual enplanements, other projections of total annual operations for Tucson International Airport were compared with the projections developed as part of the PAG RASP. Projections of total annual demand for Tucson International have been previously developed as part of the TAF, the SANS, the airport's last master plan, and the prior 1995 RASP. These prior projections are compared to the two current RASP projections for total annual operations at Tucson International in **Table 5-11**.

The trend analysis and exponential smoothing methodologies, used in this update of the PAG RASP, yield conservative estimates of future demand for Tucson International Airport, 344,589 and 348,028 annual



1995 Total Annual Operations - 238,024

2000 Total Annual Operations - 250,943

PAG RASP UPDATE	**MIX OF ANNUAL OPERATIONS TUCSON INTERNATIONAL AIRPORT**	**EXHIBIT 5-6**

operations in 2030, respectively. The prior master plan for the airport contains an estimate of future annual operations for the airport that is consistent with this Study's forecast methodologies.

Table 5-9
TOTAL OPERATIONS FORECASTS
TUCSON INTERNATIONAL AIRPORT

Year	Tucson Total Ops.
1985	237,074
1986	238,405
1987	243,940
1988	238,755
1989	221,904
1990	228,772
1991	234,872
1992	235,309
1993	228,877
1994	249,729
1995	238,024
1996	245,929
1997	238,288
1998	250,960
1999	286,362
2000	250,943

Average Annual Growth Rates

1985-2000	0.4%
1995-2000	1.1%

Sources: FAA Terminal Area Forecasts; FAA Aerospace Forecasts, Fiscal Years 2001-2012

FORECAST METHODOLOGY: HISTORIC GROWTH RATES 1995-2000	
2005	264,563
2010	278,923
2020	310,022
2030	344,589

Source: WSA Analysis

Table 5-10
EXPONENTIAL SMOOTHING
PROJECTIONS OF TOTAL ANNUAL OPERATIONS

Year	Tucson Total Ops.	Fitted Data	WSA Forecast Data	FAA TAF Data (1985-2015)
Historic				
1985	237,074	229,697		237,074
1986	238,405	231,766		238,405
1987	243,940	232,813		243,940
1988	238,755	235,497		238,755
1989	221,904	237,684		221,904
1990	228,772	238,409		228,772
1991	234,872	239,586		234,872
1992	235,309	240,665		235,309
1993	228,877	241,341		228,877
1994	249,729	241,853		249,729
1995	238,024	244,790		238,024
1996	245,929	245,520		245,929
1997	238,288	247,700		238,288
1998	250,960	248,674		250,960
1999	286,362	250,200		286,362
2000	250,943	255,501	250,943	287,854
Projected				
2005			300,118	310,473
2010			309,214	334,378
2020			328,106	386,721*
2030			348,028	447,056*

Sources: Tucson International Airport; Wilbur Smith Associates; FAA, Terminal Area Forecast.
Note: *Extrapolated.

Table 5-11
COMPARISON OF TOTAL ANNUAL OPERATIONS
TUCSON INTERNATIONAL AIRPORT

Year	Master Plan	TAF	SANS	RASP	
				Low	High
2005	297,800	310,473	289,077	308,130	301,286
2010	309,300	334,378	313,652	362,320	347,940
2020	333,200	387,370	369,247	416,512	394,589
2030	358,900	448,770	434,696	478,809	447,490

Year	Trend Analysis	Exponential Smoothing
2005	264,563	300,118
2010	278,923	309,214
2020	310,022	328,106
2030	344,589	348,028

As shown in Table 5-11, RASP methodologies and previous projections of total annual operations for Tucson International show varying demand levels for the 2030 forecast milestone. The results of the exponential smoothing model were adopted for use in the RASP, and the results of this methodology were used and refined to reflect growth in each component of aviation activity at Tucson International Airport.

Preferred Projections of Annual Operations for Tucson International

As noted, total annual operations at Tucson International are distributed and recorded in the following four categories: commercial, air taxi/commuter, military, and general aviation. The exponential smoothing model was used to predict how total operational demand in each of these categories is expected to increase between 2000 and 2030. These projections of demand, by component, for Tucson International are important to the RASP planning process because they provide insight into how other airports in the System may be called upon to play a more active role in meeting the Region's future aviation needs.

Projections of demand for each activity indicator, developed using the exponential smoothing model, are shown in **Table 5-12**. As part of the PAG RASP, the Regional Aviation System will be evaluated for its ability to accommodate both current and future levels of annual demand. Projections of demand for Tucson International shown in Table 5-12 will be important to determining the System's overall ability to satisfy future activity levels.

Table 5-12
PREFERRED TOTAL ANNUAL OPERATIONS PROJECTION BY DEMAND COMPONENT (1985 - 2000)

Year	Demand Components				
	GA Operations	Commuter Air-Taxi Operations	Commercial Operations	Military Operations	Total Operations
Historic					
1985	163,548	7,007	37,765	28,754	237,074
1986	163,904	6,157	43,646	24,698	238,405
1987	156,598	8,451	47,649	31,242	243,940
1988	153,314	9,139	43,063	33,239	238,755
1989	136,700	8,954	42,792	33,458	221,904
1990	142,547	7,375	42,765	36,085	228,772
1991	150,899	5,216	42,031	36,726	234,872
1992	154,217	6,161	38,011	36,920	235,309
1993	144,567	8,810	36,400	39,100	228,877
1994	147,148	18,239	43,911	40,431	249,729
1995	139,327	16,320	47,033	35,344	238,024
1996	142,329	14,330	46,449	42,821	245,929
1997	138,196	11,489	46,290	42,313	238,288
1998	152,039	9,872	45,436	43,613	250,960
1999	178,632	8,760	44,931	54,039	286,362
2000	144,979	13,208	45,790	46,966	250,943
Forecast					
2005	186,270	14,134	45,714	54,000	300,118
2010	192,880	15,712	46,622	54,000	309,214
2020	206,800	18,869	48,437	54,000	328,106
2030	221,750	22,026	50,252	54,000	348,028

Sources: 1985-1999 Data from FAA Terminal Area Forecast, 2001
2000 Data from Airport Management
2005-2030 WSA Analysis, 2001

As shown in Table 5-12, Tucson International Airport is expected to accommodate growing general aviation demand. According to the RASP projections, total general aviation operations at Tucson International could grow from their 2000 level of 144,979 to 221,750 by 2030. While it is not reasonable to anticipate that commercial, air taxi/commuter, or military operations could realistically be shifted elsewhere in the PAG System, it is plausible that at least some portion of Tucson International's general aviation demand could be accommodated at other airports in the System. Demand management is one viable alternative for the System to satisfy the Capacity performance measure, and also to comply with the demand/capacity benchmarks adopted for use in the RASP. Since the 1985 RASP, a demand management plan, which has experienced varying degrees of success, has been in place for Tucson International. This type of option will be reviewed and evaluated in subsequent portions of the PAG RASP.

General Aviation Demand

All airports being evaluated in the PAG RASP, with the exception of Davis-Monthan AFB, accommodate some level of general aviation activity. Within the RASP, based aircraft and total annual operations are the two demand indicators most indicative of each airport's ability to meet both current and future

demand levels. These two activity components are, therefore, the focus of the demand projections for the remaining System airports.

Based General Aviation Aircraft

Based aircraft are those aircraft permanently hangared or stored at any given airport. Based aircraft are typically recorded each year as part of the FAA's 5010 inspection program. "Counts" of based aircraft for the airports included in the PAG RASP present some unique challenges, and these challenges complicate the process of identifying reasonable historic trends in based aircraft at most System airports.

Aircraft based at Study airports can fluctuate with the seasons. Because of the large number of seasonal residents that often move to Tucson and its surrounding areas during the winter months, if in one year an airport's based aircraft count is taken in August and in the next year that count is taken in February, this can result in marked increases or decreases in the number of based aircraft that are recorded for that particular airport.

Because of climatic conditions in the Tucson area, it is not uncommon for aircraft to be "stored," as opposed to based. In some instances, these "stored" aircraft may be sold or dismantled for their pieces and parts. In any event, these stored aircraft are really not based aircraft in the true sense because it is not necessary for the airport to plan either airside or landside facilities to accommodate these particular aircraft. If these "stored" aircraft are counted and included as part of an airport's based fleet, this results in a distortion of the airport's historic growth and its resultant development needs.

The Tucson area accommodates a notable level of military demand. In fact, in addition to Davis-Monthan AFB, Tucson International houses a significant number of military aircraft. Since the military plans and provides facilities for the aircraft they base at civilian airports, military planes should not be reflected in an airport's based aircraft count. In reviewing notable swings in the number of based aircraft reported for Tucson International, in particular, it is apparent that, in some years, the airport's military aircraft have been inadvertently included in the airport's reported number of based aircraft. Since Ryan Airfield and Pinal Airpark also accommodate military activity, it is possible that based aircraft counts at these two System airports could also be subject to "inflation" from military planes.

Finally, ADOT has a registration tax for aircraft that base at Arizona airports. To avoid paying the annual registration fee, aircraft owners may report they are based at airports outside the State. This "false" reporting results in a further skewing in the number of based aircraft purportedly associated with System airports. Representatives of the Task Force, assembled to guide the development of the PAG RASP, indicate it is their belief that ADOT estimates of aircraft based at Study airports are not reflective of total based aircraft demand.

With these factors being enumerated, the viable methodologies available to project future based aircraft are limited. After review of available activity data for Study airports and of methodologies that could be used to project based aircraft, the exponential smoothing methodology was selected as the sole projection technique for this regional demand factor.

WSA's exponential smoothing model was used to project total based aircraft for the RASP airports and to assign future based aircraft to individual Study airports. The results are presented in **Table 5-13**. As shown in this table, total based aircraft at Study airports are projected to increase from a 2000 level, estimated at 954 aircraft, to 1,236 based aircraft in 2030. A brief discussion of the factors considered in developing airport- specific projections of based aircraft follows.

- Ajo Municipal Airport – Ajo Municipal is a low-activity general aviation airport. Both ADOT and FAA records for this facility indicate limited and consistent levels of based aircraft. As shown in Table 5-13, based aircraft at Ajo Municipal are projected to increased from a reported five in 2000 to 15 by the end of the planning period, 2030.

- Benson Municipal Airport – Benson Municipal is a new airport to the System; in fact, this is a new airport. Although this airport is located in neighboring Cochise County, because there is no public general airport in eastern Pima County, the decision was made to include this airport in the PAG Study and to evaluate it as part of the RASP. The airport reportedly has a current total of five based aircraft, and this number is projected to increase to 65 by the end of the planning period. Since Benson Municipal is a new airport, it has no historic trends. Future growth at this airport will be directly related to the development of on-site facilities and to the provision of aviation services. Information provided by Benson Municipal indicates that an FBO began operations in July 2001. The FBO plans to provide charter service by January, to install fuel by February, and to provide training and aircraft rentals by the summer of 2002. The airport also anticipates the near-term development of 56 hangar spaces. The airport's growth to 65 based aircraft by 2030 is contingent upon such facility development. Future growth in based aircraft at Benson Municipal would also come from Cochise County demand.

- La Cholla Airpark – La Cholla Airpark is unique in the System as it is the only privately owned study airport. La Cholla Airpark is a residential aviation community that has 112 home sites. In addition, the airpark has 40 "associate memberships"; these memberships permit non-residents to base at, and use, the facility. Considering these factors, this facility's maximum aircraft basing capacity is estimated at approximately 140 to 150 aircraft. Reviewing the airpark's historic based aircraft data (Table 5-13) shows that the airpark reportedly reached this approximate level of based aircraft in 1993, the time the RASP was last updated. Since that time, however, aircraft reportedly based at La Cholla Airpark have decreased. Current basing patterns at this facility indicate this airport has the potential to take on additional based aircraft over the planning period. As shown in Table 5-13, by the end of the forecast period in 2030, La Cholla Airpark is projected to reach its maximum aircraft basing capacity of 140 general aviation aircraft.

- Marana Northwest Regional Airport – Since the preparation of the last RASP, the ownership of this Study airport changed. Concurrent with this change in ownership, this airport's based aircraft experienced notable growth, increasing from the 130-150 range at the time of the last RASP to almost 220 in 2000. Marana Northwest Regional is an important airport in the System. Aside from Tucson International Airport, this airport accommodates the majority of the Region's general aviation corporate and business jet activity. As shown in Table 5-13, based aircraft at this airport could experience notable growth, increasing from their current level of approximately 220 to 340 by the end of the 30-year forecast period.

Table 5-13

HISTORIC AND PROJECTED BASED AIRCRAFT

Year	Ajo Municipal Airport	Benson Municipal*	La Cholla Airpark	Marana Airport	Pinal Airpark	Ryan Airfield	Sells Airport	Tucson International Airport	Total Based Aircraft
Historic									
1985	6	-	27	95	32	185	1	363	709
1986	6	-	38	95	32	187	1	372	731
1987	6	-	45	107	24	210	1	382	775
1988	6	-	64	120	24	213	1	390	818
1989	6	-	82	120	9	212	1	400	830
1990	8	-	94	123	12	210	1	410	858
1991	8	-	103	126	15	208	1	392	853
1992	8	-	124	139	18	206	1	374	870
1993	8	-	140	127	22	205	1	355	858
1994	8	-	133	151	57	205	0	337	891
1995	8	-	126	151	91	238	0	319	933
1996	8	-	119	182	97	250	0	328	984
1997	8	-	113	182	88	250	0	319	960
1998	8	-	106	182	63	253	2	323	937
1999	5	-	99	218	63	253	0	329	967
2000	5	5	92	218	58	256	0	320	954
Projected									
2005	7	15	100	235	58	274	2	320	1,011
2010	8	25	108	252	58	290	3	320	1,064
2020	12	45	124	290	58	324	4	320	1,177
2030	15	65	140	340	58	358	5	320	1,301

Sources: PAG Regional System Plan 1995, FAA Terminal Area Forecast 2000, ADOT Registration Records, Airport Management.
* It is assumed in this analysis that some of the future based aircraft demand for Benson Municipal will come from Cochise County. (Military and commercial aircraft not included in totals.)

- Pinal Airpark – This facility, located just north of Pima County, has been included in prior RASP studies. Among all Study airports, the number of "reported" aircraft based at this facility is subject to wide fluctuations; these are driven by aircraft that are "stored" versus actually based at this airport. During this Study's inventory effort, the airport reported had only four based aircraft. Yet ADOT records indicate 58 aircraft register as being based at Pinal Airpark. Any facility planning that takes place at this airport certainly needs to validate the airpark's actual number of stored versus true based aircraft. For planning purposes, the RASP has selected a constant projection of based aircraft for Pinal Airpark. This projection is consistent with the number of aircraft ADOT records currently show as being based at this particular Study airport.

- Ryan Airfield – Owned and operated by the Tucson Airport Authority, Ryan Airfield is important to accommodating the general aviation needs of the PAG Study area. Among all airports being analyzed in the RASP, Ryan Airfield accommodates the most notable percentage of the Region's flight training activities. Within the FAA's Federal airport system, Ryan Airfield functions as the only "designated reliever airport" for Tucson International. The majority of the aircraft based at Ryan Airfield fall into the single-engine and multi-engine categories; the airport accommodates a very limited number of business/corporate general aviation jet aircraft. According to projections of based aircraft developed for the RASP, this airport's based aircraft could grow from their reported 2000 level of 256 to 358 by the end of the 30-year forecast period. (See Table 5-13.)

- Sells Airport – Sells is another low-level activity airport in the Regional Aviation System that has reported no growth in the number of based aircraft over the past 15 years. Without significant changes in regional demand or socioeconomic and demographic factors, by the end of the planning period in 2030, this airport could expect based aircraft to reach a total of perhaps five.

- Tucson International Airport – While Tucson International accommodates all of the Region's commercial aircraft operations and a sizable number of military operations, this airport also serves a significant level of general aviation activity, both annual operations and based aircraft. Projections of annual general aviation operations for Tucson International were presented in a prior section of this chapter; and, as noted, the airport can anticipate notable growth in its annual general aviation operations. These operations will be attributable to aircraft that are based at this airport, but a growing number of the future general aviation operations accommodated at Tucson International will most likely be attributable to transient or visiting general aviation aircraft. As shown in Table 5-13, the number of general aviation aircraft based at Tucson International has actually declined in recent years after peaking at over 400 in the early 1990s. Based on recent trends in based aircraft at this airport, it is anticipated that the airport's number of based aircraft will remain steady over the 30-year planning period at 320 based general aviation aircraft.

Using the exponential smoothing model, a total of 1,301 based aircraft are forecasted for the System of which 1,236 based aircraft are forecasted for the Pima County region. **Exhibit 5-7** compares the results of the exponential smoothing model to those implied in the TAF. As shown in this exhibit, the projection of based aircraft developed using the exponential smoothing model is comparable to the Region's projection of based aircraft demand contained in the FAA's most recent TAF for Study airports.

While individual System airports will be examined for their ability to accommodate growth in based aircraft, reflected in Table 5-13, from a system planning standpoint, it is equally (if not more) important to ascertain the ability of the System as a whole to accommodate projected levels of growth, irrespective of where this growth actually occurs. Subsequent portions of the PAG RASP will consider the ability of the Regional Aviation System to expand to meet levels of based aircraft shown in Table 5-13 and Exhibit 5-7.

Total Non-Commercial Annual Operations

As with based general aviation aircraft, obtaining accurate estimates of total annual operations at non-towered airports provides unique challenges to the planning process. Total annual non-commercial

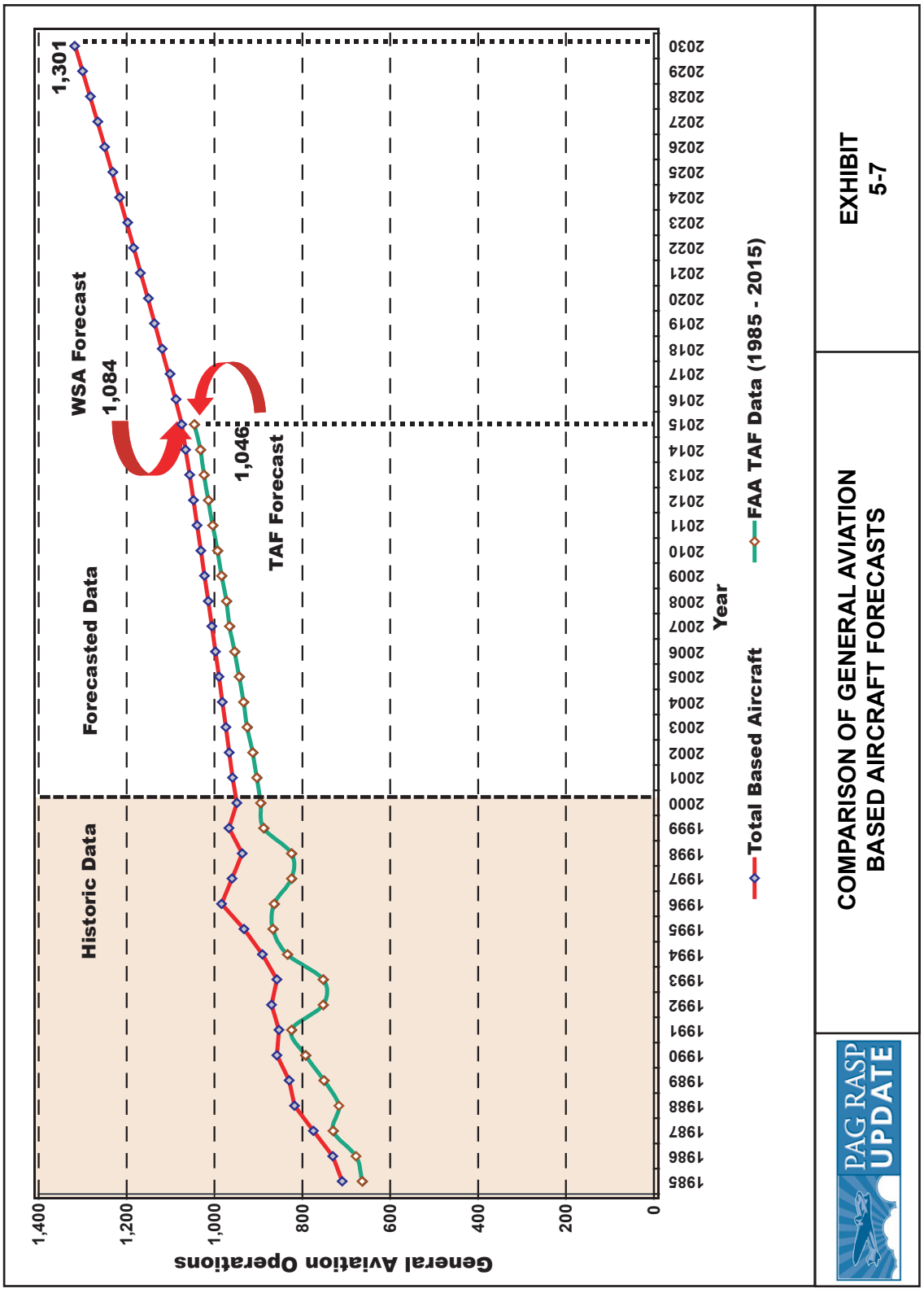


EXHIBIT
5-7
COMPARISON OF GENERAL AVIATION
BASED AIRCRAFT FORECASTS
PAG RASP
UPDATE
General Aviation Operations
1,400
1,200
1,000
800
600
400
200
0
Year
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
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2016
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2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Historic Data
Forecasted Data
WSA Forecast
1,301
1,084
TAF Forecast
1,046
Total Based Aircraft
FAA TAF Data (1985 - 2015)

operations for Tucson International Airport were previously projected using an exponential smoothing model. Use of this model to project total annual non-commercial operations for this airport was enabled by the fact that records of total annual operations are available from this particular airport's control tower reports.

For other System airports, however, it was necessary to identify and select another methodology to project total annual non-commercial operations. Based on available data, an operations per based aircraft (OPBA) methodology was selected to project total annual operations for the remaining Study airports. In this methodology, a relationship between based aircraft and total annual operations is developed. This relationship is then used to project future annual operations over the forecast period. It is important to note that, with this particular methodology, the OPBA reflects operations performed by aircraft based at each airport, as well as operations conducted by visiting or transient aircraft.

Information available for airports analyzed in the RASP results in an average OPBA of approximately 395 for all System airports. This OPBA ratio is typical of those identified for airports in other metropolitan areas. If airports accommodate higher levels of transient operations or if they support notable training activities, then corresponding OPBAs may increase.

The Region's average OPBA of 395 is applicable to airports in the System with the exceptions of Ryan Airfield, Tucson International, Sells, and La Cholla, for the RASP. As noted previously, Tucson International accommodates a notable level of transient aviation activity; this activity has previously been projected using the exponential smoothing model. Ryan Airfield supports an above-average level of training activity, thus increasing its OPBA. Data collected as part of the RASP indicates an OPBA of 680 is more applicable to Ryan Airfield. Since Sells accommodates operations by primarily visiting (transient) aircraft, its OPBA was estimated at 655. The unique nature of La Cholla Airpark also results in a unique OPBA; La Cholla's OPBA is estimated at 120.

Projections of total annual operations were developed for System airports using the OPBAs identified in this section of the RASP, with the exceptions of Tucson International and Davis-Monthan AFB. The projections of total annual general aviation operations are presented in **Table 5-14**.

Summary of Demand Projections

Table 5-15 summarizes the PAG RASP aviation demand projections. These projections are not intended to replace forecasts of demand developed as part of individual airport master plans. These projections will primarily be used in the RASP to evaluate the System's ability to meet Capacity performance measures.

Almost all airports in the U.S. experienced a downturn in traffic following the events of September 11. As part of the forecasting process, as a check on the reasonableness of the projections of demand, a comparison was made on a month-to-month basis between activity levels in 2000 and 2001. Since Ryan Airfield and Tucson International are the only two System airports with air traffic control towers, this monthly comparison could only be completed for these airports. This comparison is as follows:

Ryan Airfield Monthly Total Operations

	2000	2001
September	12,013	8,226
October	12,299	13,775
November	13,311	12,230
December	12,871	11,083

Tucson International Enplaned Passengers

	2000	2001
September	257,921	185,433
October	319,895	274,529
November	331,232	278,883
December	310,013	278,432

Tucson International Total Operations

	2000	2001
September	22,393	15,321
October	21,762	22,930
November	21,297	21,596
December	17,608	19,910

Table 5-14
PROJECTION OF TOTAL ANNUAL NON-COMMERCIAL OPERATIONS

	2000	2005	2010	2020	2030
Ajo Municipal	1,900	2,767	3,160	4,740	5,925
Benson Municipal	1,500	5,925	9,875	17,775	25,675
La Cholla Airpark	4,000	12,000	12,960	14,880	16,800
Marana Northwest	71,300	92,825	99,540	114,550	134,300
Pinal Airpark	18,815	18,800	18,800	18,800	18,800
Ryan Airfield	174,461	186,320	197,200	220,320	243,440
Sells Airport	1,310	1,310	1,965	2,620	3,275
Tucson International	144,979	186,270	192,880	206,800	221,750
Regional Total	417,265	506,217	537,035	600,485	669,965

Note: Operation developed using an OPBA of 395; an OPBA of 560 was used for Ryan Airfield based on its higher level of training activity. Non-commercial operations for TIA developed using exponential smoothing model.

Table 5-15
SUMMARY OF DEMAND PROJECTIONS

	2000	2005	2010	2020	2030
Tucson International Enplanements					
- High	1,816,142	2,068,201	2,355,242	3,054,369	3,961,022
- Average	1,816,142	1,952,288	2,088,434	2,360,725	2,633,017
Based Aircraft	320	320	320	320	320
Annual Operations*	250,943	300,118	309,214	328,106	348,028
Ajo Municipal					
Based Aircraft	5	7	8	12	15
Annual Operations	1,900	2,767	3,160	4,740	5,925
Benson Municipal**					
Based Aircraft	5	15	25	45	65
Annual Operations	500	5,925	9,875	17,775	25,675
La Cholla Airpark					
Based Aircraft	92	100	108	124	140
Annual Operations	4,000	12,000	12,960	14,880	16,800
Marana Northwest					
Based Aircraft	218	235	252	290	340
Annual Operations	71,300	92,825	99,540	114,550	134,300
Pinal Airpark					
Based Aircraft	58	58	58	58	58
Annual Operations	18,815	18,800	18,800	18,800	18,800
Ryan Airfield					
Based Aircraft	256	274	290	324	358
Annual Operations	174,461	186,320	197,200	220,320	243,440
Sells					
Based Aircraft	0	2	3	4	5
Annual Operations	1,310	1,310	1,965	2,620	3,275
TOTAL					
Based Aircraft	954	1,011	1,064	1,177	1,301
General Aviation Operations	417,265	506,217	537,035	600,485	669,965

* Includes military, commercial, commuter air-taxi and general aviation operations.
** Some future demand for Benson Municipal will come from Cochise County.

Several conclusions can be drawn from this information. As shown above, while Ryan Airfield's monthly operations were down in September from the previous year, by October, monthly operations actually exceeded the operations in the previous year. With the exception of September, total monthly operations at Tucson International in 2001 exceeded monthly operations in the previous year. Total annual operations at Tucson International were up 10,000 in 2001 from the total reported in 2000. While monthly enplaned

passengers at Tucson International were down 28 percent in September from the previous September, by December, enplanements were only running 10 percent behind from the previous year. On an annual basis, enplanements were actually up slightly between 2000 and 2001 at Tucson International (1,816,142 versus 1,818,307). These figures indicate that aviation demand in the Region is, in fact, rebounding from the events of September 11, and there is every reason to believe that the forecasts prepared as part of the PAG RASP represent reasonable estimates of future aviation activity for System airports.

Regional projections for total based aircraft and total annual operations prepared as part of this RASP were compared to similar projections contained in the 1995 RASP. Table 5-13 shows Pima County based aircraft increasing to 1,236 in 2030. The 1995 RASP projected based aircraft to reach 1,360 by 2020; had this projected rate of growth continued for the next 10 years, by 2030, (according to the 1995 RASP projections) based aircraft for all System airports could reach 1,660. The based aircraft projection contained in the 1995 RASP is somewhat more aggressive than projections developed as part of this update. Projections of based aircraft contained in this PAG RASP are more conservative.

Projections of total annual operations prepared as part of this RASP are comparable to the regional totals developed in the 1995 RASP. Using growth rates implied in the 1995 RASP, total annual general aviation operations for all Study airports could have been expected to reach 721,480 by 2030. According to projections of total annual operations developed for Study airports in this RASP, by 2030, total annual operations could reach 669,965.

Chapter One of the RASP identified performance measures that will be used to evaluate the Regional Aviation System. These measures were identified specifically to ensure that the Region's system of airports would not be evaluated from a one-dimensional perspective. Because a wide variety of performance measures will be used to evaluate the System, identifying its adequacies, deficiencies, and surpluses, the role these projections of demand will play in evaluating the System and identifying its future needs is minimized.

Chapter Four of the RASP presented information on past and anticipated national trends for both commercial and general aviation. This chapter of the RASP provided information on historic and projected aviation trends for Pima County and the RASP airports. This section provides a brief comparison between the national trends identified in Chapter Four and the regional trends and projections presented in this chapter.

Commercial Demand

According to information obtained from the FAA, domestic enplanements in the United States have grown historically at an average annual rate of 3.8 percent. In its most recent national forecast for all facets of aviation activity in the U.S., the FAA projected the nation's domestic enplanements to increase at an average annual rate of 3.6 percent.

Information presented in the RASP shows that, historically, total annual enplanements for the Region have increased at an average annual rate of 2.6 percent, as compared to the national historic average annual rate of increase of 3.8 percent. The Region's total annual historic enplanements grew below the U.S. average. Two projections of total annual enplanements were prepared for the RASP. In the average-

growth scenario, the Region's total annual enplanements could be expected to increase at an average annual rate of 1.25 percent, while in the high-growth scenario, total annual regional enplanements are projected to increase at an average annual rate of 2.6 percent. Both of these anticipated average annual rates of growth are below the rate projected by the FAA for all U.S. domestic enplanements. However, since the Region's historic enplanements increased at an average annual rate that was 1.2 percent below the national average, this lower rate of projected average annual growth is anticipated. Since the FAA's projected average annual rate of growth to total U.S. domestic enplanements is similar to the actual historic rate of average annual growth, 3.8 percent versus 3.6 percent, this would support the high-growth scenario, which shows the Region's total enplanements increasing at an average annual rate of 2.6 percent over the forecast period.

While the FAA does not project "based aircraft" on the national level, they do project total active general aviation aircraft. Historically, active general aviation aircraft in the U.S. have reportedly increased at an average annual rate of 3.3 percent. In their most recent national forecast, the FAA projected active general aviation aircraft in the U.S. to grow at an average annual rate of .89 percent.

Historically total based aircraft in the Pima County Study Area increased at an average annual rate of growth of 2.0 percent. This average annual rate of growth is below the rate of growth in total active general aviation aircraft reported nationwide by the FAA. The projected average annual rate of growth for based aircraft in the RASP is .85 percent. This projected average annual rate of growth is very similar to FAA's projected rate of growth for active general aviation aircraft in the U.S.

In addition to projecting total active general aviation aircraft, the FAA, in their national forecast, also examines the fleet mix, or aircraft by category or type. According to the FAA, the national fleet is currently distributed among various general aviation aircraft types as follows on **Table 5-16**:

Table 5-16
EXISTING AND FUTURE GENERAL AVIATION FLEET DISTRIBUTION

Aircraft Type	2000 Fleet Mix	Projected 2012 Fleet Mix
Single-Engine Piston	69%	69%
Multi-Engine and Turboprop	13%	12%
Jet	3%	5%
Helicopter and Other	15%	17%

According to information collected as part of the inventory portion of the RASP, for comparative purposes, the current Regional fleet mix is as follows:

Single-Engine Piston	76%
Multi-Engine and Turboprop	12%
Jet	8%
Helicopter and Other	4%

Based on national trends anticipated by the FAA, the Region should expect that single-engine aircraft as a percent of the regional total should decline. The Region's multi-engine and turboprop fleet is already reflective of the national average/trend. The Region's percent of jet aircraft in general aviation already exceeds the national average. Based on recent national trends, however, especially growing air charter, air taxi, fractional ownership, and other business demand that has increased directly as a result of the events of September 11, the Region should expect business jet aircraft and business jet operations to continue to increase as a percent of the Region's general aviation based and operational fleet. Growth in the percentage of other aircraft and helicopters in the Region should also be expected, based on national trends and projections.

Aviation system plans prepared in the 1970s and 1980s, and even to some extent into the 1990s, relied almost exclusively on a capacity-based performance evaluation. In today's aviation environment, it is widely recognized that "good" aviation systems must be multi-faceted, exhibiting characteristics beyond those needed just to satisfy current and future demand levels.